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The Design Criteria in Implementation of a Health Management Information System: a Case of Kenyatta National Hospital

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Abstract

Embracing modern technology is one among very many ways of improving efficiency and reducing costs within healthcare organizations. While the integration of information and health services potential benefits cannot be disputed, there are many challenges which affect its adoption, in fact, majority of organizations have abandoned their newly acquired systems only to go back to their old manual systems.

The objective of this study was to determine the design phase of the implemented Health Management Information System at Kenyatta National Hospital. This study was a cross-sectional descriptive study, the targeted population of the study were 35 healthcare workers who were involved in the designing of the Health Management Information System at Kenyatta National Hospital, and the sample technique used was snowball sampling.

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The study utilized an in-depth interview schedule for 33 respondents in the design phase who were selected using snow-ball, the data collected from the field was analyzed through the use of univariate and bivariate statistics. Data presentation was in form of descriptive statistics such as frequency distribution, percentages, pie charts, bar graphs and tables.

The data from the design phase were summarized in three main evaluation areas targeting the perception of the HMIS, purposes and processes. From the findings, in the design stage although the respondents did not show systematic ordering there was evidence to the effect that the steps were followed during the design phase. From the findings majority of the key informants were able to define HMIS and distinguish the key features of the HMIS. Out of the 33 participants, 13 (33.4%) reported that they knew the persons who originated the idea of the electronic HMIS in KNH, a similar number were involved in the conceptualization of the system, while 4 (12.2%) indicated that they were involved in designing the HMIS and 18 (54.6%) were involved in implementation. Despite the general lack of knowledge on HMIS policy the informants demonstrated adequate understanding of the objectives of the electronic HMIS in KNH. Based on the responses obtained during interviews there were multiple problems related to the manual system that existed in KNH during the pre-implementation stage and these issues served as the basis for objective setting for the current HMIS in the hospital. Most key informants felt that the hypothesized benefits of the current HMIS were being realized including improved efficiency while four key informants felt that the benefits had been partially realized. An evaluation of the manual HMIS was done during which deficiencies of the HMIS were identified through consultations involving HMIS users and stakeholder. A HMIS needs assessment was conducted and formed the basis of the electronic system requirements with specific proposals for improvement of the deficiencies identified in the manual HMIS. An evaluation of the manual HMIS was done during which deficiencies of the HMIS were identified through consultations involving HMIS users and stakeholder. During the interviews the participants were able to highlight various aspects of the IS development cycle and there was evidence to the effect that the steps were followed during the design phase plus an evaluation of the manual system was done during which deficiencies of the system were identified through consultations involving HMIS users and stakeholders.

Based on the results and discussions, among the main problems that key informants described during the design phase was major inefficiencies characterized by evident mismatching of resources input and output which spanned several areas including time, human resources and finances however, participants were able to highlight various aspects of the IS development cycle and there was evidence to the effect that the steps were followed during the design phase, planning plus an evaluation of the manual system was done during which deficiencies of the system were identified through consultations involving HMIS users and stakeholders. As a recommendation we can say that NH and the MOH needs to come up with an established standardized policy for implementing interventions.

Keywords: HMIS- Health Management Information Systems; KNH-Kenyatta National Hospital; HSS-Health Systems Strengthening; ICT-Information Communication Technology; SDLC-Software Development Life Cycle.

1. Introduction

The current WHO framework for action on Health systems describes six clearly defined health system building blocks that together constitute a complete health system [1]. Many developed countries such as Singapore, Canada, United States of America and United Kingdom have invested huge amounts of money for stimulating Health Management Information System (HMIS) adoption while developing countries are still struggling to make do with the traditional healthcare setup. The implementation of a HMIS which is an information system specifically designed to assist in the management and planning of health programs as opposed to delivery of care, aims to strengthen and thus improve the effectiveness and efficiency of health data.

A deeper understanding of the prevailing health situation is critical to appreciate the progress to be made in delivering quality healthcare services. Good health services are those which deliver effective, safe, quality interventions to those who need them, at the right time, place and with least wastage of resources [2]. A Health Management Information System (HMIS) can be a powerful tool to make health care delivery more effective and far more efficient.

An iterative process before implementing any health management information system is needed, in that changes identified during the process must be evaluated to determine their effect on completed analyses. In order to achieve maximum returns on an investment or intervention evaluation should be from the outset. The process must consider system life cycle management and the organization's policy and budget as important integral factors, and include all organizational participants (e.g., managers, users, maintainers, operators, and designers) throughout the process. Information systems are important tools for effectively meeting organizational objectives [3].

The organization must identify its information needs on the basis of a systematic identification and analysis of its mission and functions to be performed, who is to perform them, the information and supporting data needed to perform the functions, and the processes needed to most usefully structure the information. Successful information system development and acquisition must include a rigorous and disciplined process of data gathering, evaluation, and analysis prior to committing significant financial and human resources to any information system development. While implementing such an approach may not preclude all information system acquisition problems, it should produce detailed knowledge of organizational missions and operations, user information needs and alternatives to address those needs, and an open and flexible architecture that is expandable or that can be upgraded to meet future needs [4].

1.1 Study Purpose

The aim of the study was to examine the design phase the Health Management Information System: A case of Kenyatta National Hospital

1.2 Limitations of the Study

Due to limited time and resources the researcher did not expound on all the key variables in HMIS

implementation, other variable will be subject for another study. Overall process was time consuming and financially demanding despite a work plan and budget. Also the issue of obtaining an ethical letter for permission to collect data from the hospital was time consuming and needed a lot of effort and patience from the research and ethics board. In qualitative studies you don't have to justify the sample size and thus generalization which makes it difficult to come up with inferences.

1.3 Delimitations of the Study

This study concentrated only on Kenyatta National Hospital. The study focused on the examining of the design criteria in the HMIS implementation at the Kenyatta national hospital. The variable aspects considered included; Perceptions, purposes and processes involved in the design criteria of a HMIS implementation. Other factors affecting HMIS implementation may act as confounders not tackled in this study and were to be a subject of follow up studies.

1.4 Significance of the Study

Health information systems, one of the WHO pillars serve multiple users and a wide array of purposes that can be summarized as the generation of information to enable decision-makers at all levels of the health system to identify problems and needs, make evidence-based decisions on health policy and allocate scarce resources optimally. Health systems are at the heart of how countries respond to new disease threats and improving health of the people. The iterative nature of the process cannot be further overemphasized; any changes in mission, operations, functions, or information and data needs must be assessed to reveal their impact on analyses already completed, since these changes could have a profound effect on the system to be acquired. KNH's vision is to be a world class referral hospital in the provision of innovative and specialized health care and its mission is to provide accessible specialized quality healthcare, this cannot be significant or achieved without incorporating and embracing HMIS. In order to support and develop a robust health IT workforce and maximize successful adoption of digital records across the KNH spectrum, barriers of HMIS implementation will have to be contained. The study outcomes were to assist KNH and other healthcare organizations avoid impediments when implementing HMIS and instead have leverage towards implementing HMIS.

1.5 Conceptual Framework:

Based on the discussion of the various variables, the study was guided by the following conceptual Framework. See Figure 1.

2. Materials and Methods

The study was conducted in Nairobi County at Kenyatta National Hospital and used a descriptive purposeful research design. Purposeful sampling, in contrast to probabilistic sampling, is "selecting information-rich cases for study in depth". In this case KNH being at the apex of the National Hospital Referral System was purposefully selected. These shall allow the study to collect data which will be analyzed quantitatively using descriptive and inferential statistics [5]. Therefore, the descriptive survey was deemed the best strategy to fulfill

the objectives of this study. The design took on a case study at KNH.

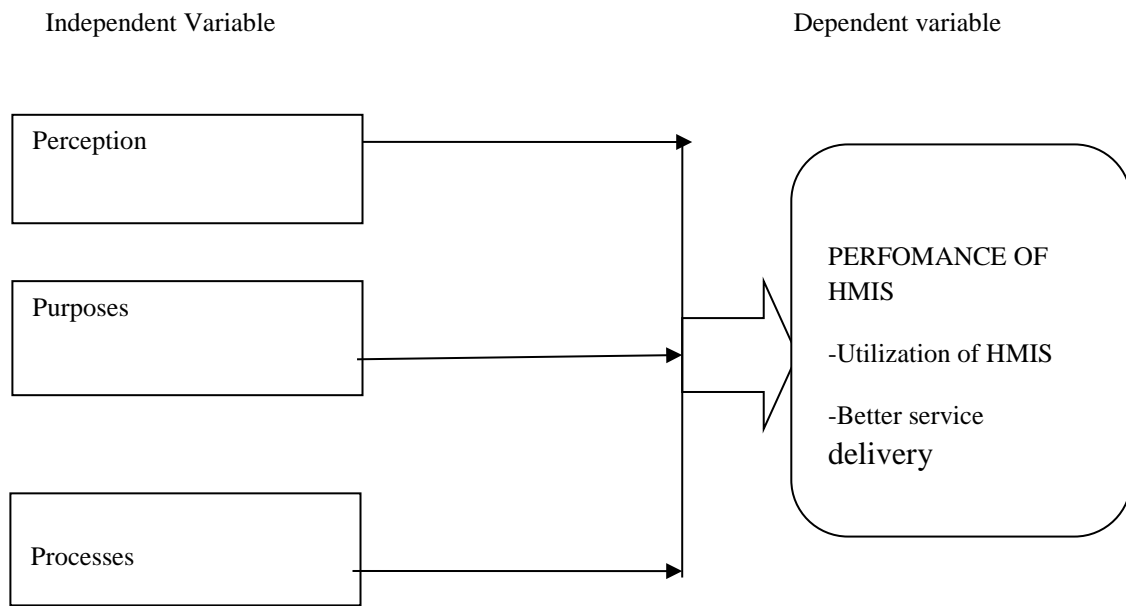


Figure 1: Conceptual Framework

The targeted population were 35 accredited healthcare service delivery officers at Kenyatta National Hospital who were directly or indirectly involved in the design phase of implementing HMIS. The scope was deemed appropriate due to the fact that with rise in technology, urban areas and cities in specific embrace it with ease. The scope was also significant to minimize expenses which would otherwise be incurred outside the researchers' residential city.

The researcher used snow-ball sampling; Snowball sampling is usually done where there is a very small population size [5]. Then the subjects or units direct you to the next potential respondent. This method is used when one is unable to access a wider population, for example due to time or cost constraints.

From the study the independent variables were the perception, purpose and processes in the design criteria when implementing a Health Management Information System at the Kenyatta National Hospital, since an *independent variable* refers to the status of the presumed cause whereas the *dependent variable* is the presumed effect. Effectual Implementation of Health Management Information System at the Kenyatta National Hospital due to the importance of the design criteria thus was the dependent variable.

Despite these being purely a qualitative data. Data analysis was done using SPSS, Ms Excel and Ms Word software's with univariate, bivariate and thematic statistics being utilized. Thematic statistics were used to convert conversations into themes or codes for qualitative statistics. These involved describing the way in which quantitative data tended to cluster around some value. Bivariate analysis is one of the simplest forms of quantitative (statistical) analysis. It involves the analysis of two variables for the purpose of determining the empirical relationship between them in order to see if the variables are related to one another, it is common to measure how those two variables simultaneously change together Bivariate analysis can be helpful in testing

simple hypotheses of association.

Before data collection, a permit was sort from the Kenya Methodist University and the Kenyatta National Hospital/University of Nairobi ethics committee. On production of the research permit, consideration for permission to carry out the research was to be granted by the research and ethics board team. The Administrators, staff and the support staff of the departments selected were informed in advance concerning the visits and for data collection in their respective departments and offices. The researcher ensured that confidentiality was paramount and the information obtained used only for the purpose of these study.

3. Results

The response rate was more than 90% of the targeted respondents and the findings were for the analysis of qualitative data collected from 33 health workers who were working within KNH during the HMIS design phase, this formed the basis for evaluation of the design criteria of the HMIS. The data from the design phase were summarized in three main evaluation areas targeting the perception of the HMIS, purposes and processes.

3.1 Perception of KNH's HMIS

Most key informants were able to define HMIS and distinguish the key features of the HMIS that was operated by KNH during the pre-implementation in terms of its manual information processing and the transition to an electronic information processing HMIS. However, with the exception of a few participants in the strategic management level, ICT and health information departments, most participants were unaware of the existence and contents of the institutional HMIS policy and these compared well with the statement by [6] that evaluation of DHMIS is one of the most neglected areas in the MOH Kenya and without the comprehensive evaluation criteria there is little justification of maintaining or implementing a HMIS. The informants had a global view of HMIS and considered it a part of hospital function that interacted with other components within the hospital to help in attainment of institutional objectives through processing and managing information related to health care services provided within hospital premises. One of the respondents actually stated that:

“Health information is the glue that sticks all the departments of the hospital together”

(In-depth interview schedule Respondent 13)

From the findings majority of the key informants were able to define HMIS and distinguish the key features of the HMIS, these was in agreement with the definition given by [1] which is an information system specifically designed to assist in the management and planning of health programs as opposed to delivery of care, aims to strengthen and thus improve the effectiveness and efficiency of health data. Out of the 33 participants, 13 (33.4%) reported that they knew the persons who originated the idea of the electronic HMIS in KNH, a similar number were involved in the conceptualization of the system, while 4 (12.2%) indicated that they were involved in designing the HMIS and 18 (54.6%) were involved in implementation and these coincided with [3]whom stated that an iterative process before implementing any health management information system is needed, in that changes identified during the process must be evaluated to determine their effect on completed analyses,

thus, there was significance stakeholder involvement during the design criteria

3.2 Purpose of KNH's Electronic HMIS

Despite the general lack of knowledge on HMIS policy the informants demonstrated adequate understanding of the objectives of the electronic HMIS in KNH. Based on the responses obtained during interviews there were multiple problems related to the manual system that existed in KNH during the pre-implementation stage and these issues served as the basis for objective setting for the current HMIS in the hospital. The main purposes of the HMIS system listed by key informants were to: improve efficiency, improve data quality, reduce loss of hospital data, reduce data archiving and storage requirements, and promote automation and integration of hospital processes and procedures and these indicated why KNH re-aligned its strategic focus and interventions for the Hospital to meet the challenges it faces in the implementation of its mandate and among the strategic plans was adoption of ICT to improve its performance to the expected international standards it intends to achieve [7].

Among the main problems that key informants described during the design phase were major inefficiencies characterized by evident mismatching of resources input and output these inefficiencies spanned several areas including time, human resources and finances and these is characterized in the [8] document that states, in Kenya, Health information is not yet integrated with information technology as in developed countries thus affecting other Health Systems Management building blocks and primary health principals in achieving better health. The key informants considered the manual management of health information as an inefficient use of both staff and patient time. Time requirements for performing routine searching and archiving of hospital records resulted in prolonged patient waiting times across hospital department and inefficient use of staff time in areas involved in providing direct patient care. With regard to financial inefficiency the key informants estimated that there were significant losses in hospital revenue when the hospital fiscal system was based on a manual receipting and accounting.

One in-depth interviewee stated that;

“The HMIS has realized its intended purpose because patients are currently being attended to faster compared to the previous manual regime system”

(In-depth interview schedule Respondent 05)

An additional purpose of the HMIS at inception was to address the problem of loss of records that was frequently reported in the pre-implementation phase. Key informants reported that a closely related and more common problem compared to loss of records was the poor quality of data majorly characterized by missing information within records. Separately health workers thought that the HMIS modules could add functionalities to the information management process that were not possible to implement through the manual system that existed during the pre-implementation phase for example integration and sharing of information across hospital departments, and automating routine hospital data analysis and reporting systems. These confirmed the document [9] that as the African nations move towards a more technologically advanced health care system,

providers will need a highly skilled health information technology (IT) workforce to support them in the adoption and meaningful use of electronic health records in healthcare service delivery. Finally, the key informants considered the large volume of information generated in KNH as a major limitation to the pre-implementation HMIS both in terms of data handling and management and also physical storage space but one that could be addressed by the current HMIS. Most key informants felt that the hypothesized benefits of the current HMIS were being realized including improved efficiency while four key informants felt that the benefits had been partially realized.

3.3 Processes in the Design Criteria

The theoretical framework by Heeks, references [10,11] statements about adhering to a formal framework commonly referred to as a Software Development Life Cycle (SDLC) as being the best approach for creating an EMR system that meets requirements from the outset and within project budget and schedule was evident in that the key informants described details of processes involved in designing, implementing and operation phases of the electronic HMIS that were laid down during the design phase. During the interviews the participants were able to highlight various aspects of the IS development cycle and there was evidence to the effect that the steps were followed during the design phase plus an evaluation of the manual system was done during which deficiencies of the system were identified through consultations involving HMIS users and stakeholders. Although the responses did not show systematic ordering there was evidence to the effect that the steps were followed during pre-implementation planning.

However, it was noted that only four participants were involved throughout the processes from conceptualization, design to implementation and with the exception of a few participants in the strategic management level, ICT and health information departments, most participants were unaware of the existence and contents of the institutional HMIS policy. The informants had a global view of HMIS and considered it a part of hospital function that interacted with other components within the hospital to help in attainment of institutional objectives through processing and managing information related to health care services provided within hospital premises and these supported document [12] that stated Health systems' strengthening is rising on political agendas worldwide. Precise and nuanced knowledge and understanding of what constitutes an effective health system is growing all the time.

An evaluation of the manual HMIS was done during which deficiencies of the HMIS were identified through consultations involving HMIS users and stakeholder. A HMIS needs assessment was conducted and formed the basis of the electronic system requirements with specific proposals for improvement of the deficiencies identified in the manual HMIS. Stakeholder and partners including MOH, health insurers and KNH staff and management were involved in system design, with plans involving hardware, software and operating system acquisition. System designers were involved both from within KNH and external support was sought. A period of system development followed during which the electronic HMIS components were obtained and installed and the proposed system was designed. Pretesting was planned and was to involve users, and stakeholders, while training and sensitization on the electronic HMIS was planned to be run concurrently.

One of the respondents in the design phase quoted that:

“During the design of the HMIS two key activities were conducted namely; analysis of the strength and weaknesses of the current existing system followed by a discussion and agreement of a comprehensive system.”

(In-depth interview schedule Respondent 07)

4. Conclusions

Based on the results and discussions, among the main problems that key informants described during the design phase were major inefficiencies characterized by evident mismatching of resources input and output which spanned several areas including time, human resources and finances however, participants were able to highlight various aspects of the IS development cycle and there was evidence to the effect that the steps were followed during the design phase, planning plus an evaluation of the manual system was done during which deficiencies of the system were identified through consultations involving HMIS users and stakeholders. There was significant stakeholder involvement in the design criteria and these manifested through definition and identification of the KNH's HMIS, clear understanding of the purpose and process in the design criteria and thus an indication that the design criteria was observed during the HMIS implementation.

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Appendixes

Appendixes, if needed are in the main thesis document.